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A CONTRIBUTION TO THE FLORA OF GREENLAND.

BY WILLIAM E. MEEHAN.

Early in 1891 the Academy of Natural Sciences of Philadelphia endorsed Lieutenant Peary's proposition to explore Northern Greenland, and organized the West Greenland Expedition under the leadership of Professor Angelo Heilprin, to take the explorer and his party to the spot chosen for their winter quarters. Dr. William H. Burk, one of the Associate Editors of the *Public Ledger* was appointed botanist of the escorting party.

The two expeditions left Brooklyn on June 6th, 1891, in the steam whaler "Kite" and reached McCormick Bay, in latitude $77^{\circ} 43'$ about the 29th of July. Here Mr. Peary and his party were left in a comfortable frame structure which was erected on landing and which is known in the annals of the expedition as the "Red Cliff House."

The plants collected by Dr. Burk had barely been determined at the Academy when there were indications that another expedition might be sent to the same region, and it was thereupon decided not to list the plants till the second collection should have been made.

Lieutenant Peary had made his own arrangements to return and events showed that he might, perhaps, have been able to carry out his plans; but the rumors of possible disaster led to a search expedition. This was also placed in charge of Professor Angelo Heilprin, who had before demonstrated his capabilities for that position, and the writer, like Dr. Burk, a member of the editorial staff of the *Public Ledger*, was accepted as Botanist.

The "Kite" was again chartered for the expedition that left St. Johns, Newfoundland, on the afternoon of July 5th, 1892. It reached the Island of Disco on the evening of July 14th and anchored before the settlement of Godhavn, the capital of the Northern Inspectorate of South Greenland, where the party remained until the evening of the 16th.

Collections of plants were made by the writer here, and subsequently at the following points farther north and south; Upernavik, Cape York, Wostenholm Island, McCormick Bay, about the abandoned Etah Eskimos settlement near Littleton Island, Sontag Bay, Robertsons Bay, Nunatak in the Verhøeff Glacier, the borders of Ingfield Gulf, table land of Greenland near McCormick

Bay, and Godthaab, the capital of the Southern Inspectorate of South Greenland.

Dr. Burk's collections were made at Godhavn, Upernavik, Duck Islands, Cape York and McCormick Bay.

The range of territory covered by the writer and Dr. Burk, therefore, was between about latitude 63° and above 78° or between Godthaab and Littleton Island.

In the catalogue prepared, a copy of which with remarks is appended, those which were collected only by Dr. Burk are so stated, as also are those collected only by the writer. As nearly the whole collection was repeated by each collector, it may be taken as a fairly complete flora of that portion of the territory of Greenland.

Before starting in their respective journeys, both Dr. Burk and the writer were instructed to examine as far as possible the influence of ice sheets on the geographical distribution of plants. Professor Thomas Meehan, the father of the latter, in a "Catalogue of Plants collected in July, 1883, during an Excursion along the Pacific Coast in Southeastern Alaska"¹ had given reasons for believing that plants did not merely advance in the wake of retreating glaciers, or push into growth from material brought down in their advance, but that when caught under the mass of flowing ice, would remain for an indefinite period, retaining vitality, and push again into growth when the ice retreated. Professor Meehan was led to this conclusion from finding no annual plants among those collected in the immediate wake of retreating glaciers in Alaska, while the actual number of species of perennials collected in such locations would be as great as if much time had been given for a floral advance. He had but little opportunity for actual observation as to the plants brought down with the earth carried on the ice, but so far as this went only *Epilobium latifolium* and *Dryas octopetala* were found in this condition, and scarcely any plants were observed on recently deposited moraines. These and some other facts led to the hypothesis that the plants were not migratory, but had held their position through the whole icy period.

The writer believes he has added to these facts by the determination of the existence of much the same flora in isolated spots of land recently bared by the névé of the inland ice, as grow away from the margins of the ice sheet, while the finding of living willow trunks, grass and perennial plants of many years growth close to the edges

¹ Proceedings of the Academy of Natural Sciences of Philada., 1884.

of retreating glaciers, seem to place the point beyond any reasonable doubt, especially when after careful survey, through the construction and positions of the glaciers, there was the absolute certainty that the plants could not have been deposited by lateral, medial or terminal moraines, though they might have been by ground moraines,—a circumstance which would settle Professor Meehan's position affirmatively beyond dispute, since the ground moraines are borne under the flowing ice rivers. Abundant vegetation was also found in nunataks,—peaks of land projecting above the glaciers or ice cap,—but little significance was placed on this circumstance since all such nunataks visited were within a reasonably close proximity to the main land masses, and the vegetation might readily have sprung from seeds blown there by the winds or brought by mud on the feet of birds. But the demonstration of aged living plants in the other situations named must have a strong bearing on the discussions involved as to the influence of the ice age on the distribution of plants over the surface of the earth.

The abundance of lichens is characteristic of the flora of Greenland. Rocks supposed from a distance to be naturally colored are found on closer inspection to derive their hue from a complete investiture of some lichen. In this particular the crimson cliffs, beginning at Cape York and extending many miles northward, are a conspicuous example. These cliffs, rising sheer from the water's edge to heights of from seventeen hundred to two thousand feet or more, though of gray granite, show no spot of the intrinsic color even on being nearly approached, but present a uniform red appearance over their whole surface from a large orange red lichen which covers them.

In view of Schwendener's theory that lichens are but symbiotic forms of algæ and fungi, it is to be regretted that the probably rich fields afforded by the latter named great families in this region have yet to be investigated.

Mosses are even more abundant than lichens. They grow in such vast quantities in spots, that their light or dark greens are visible often for some miles away, brightening the otherwise bleak shores wonderfully. Their persistence in growth under apparently adverse circumstances is also remarkable. No obstacle save the sea seems sufficient to stop their progress. Even dead glaciers have been and are being buried under the steady march of these cryptogamous plants. Mosses fulfil the same duty in Greenland that other forms

of plant life perform in more favored climes, and the amount of rich vegetable matter being deposited by them may be of great value in the future to that great arctic island.

The Academy is indebted to Mr. Stewardson Brown, Corresponding Secretary of its Botanical Section, for the determination of the flowering plants; to Dr. John W. Eckfeldt for the determination of the lichens, while for the naming of the mosses the Academy is indebted to the kindness of Mrs. N. L. Britton of New York, whose knowledge of this department of botany is conceded to be pre-eminent.

Ranunculus Lapponicus L.

Dr. Burk.

Ranunculus nivalis L.

Etah, in great abundance, and with great vigor, a point characteristic of the vegetation about this ancient Esquimo settlement.

Ranunculus pygmæus Wahl.

Apparently confined to swampy places.

Papaver nudicaule L.

Common everywhere in Greenland. A remarkably variable plant. On the table land, back of McCormick Bay (Prudhoe Land) a white flowered form is somewhat common; it has a more compact habit and smaller flowers than the yellow or more prevalent form. On Wostenholm Island, the compactness of growth is particularly marked. The number of petals varies, and the margins are not unfrequently fimbriate. In the vicinity of Disco the peduncles are hairy. At Upernavik forms with hairy and smooth peduncles grow together.

Cheiranthus pygmæus Adams.

Dr. Burk.

Arabis alpina L.

Found only on Disco Island—only two specimens on soggy ground, one in flower the other in fruit.

Cardamine pratensis var. *alpina* L.

Not in Dr. Burk's collections, and a single specimen only gathered in wet ground on Disco Island.

Vesicaria arctica Rich.

Inglefield Gulf in dry places between rocks, in fruit middle of August.

***Draba alpina* L.**

Several varieties. McCormick Bay.

***Draba hirta* L.**

Varying remarkably in different localities. At Disco more tall and slender than at Etah. In company with *Papaver nudicaule*, *Dryas*, several *Ranunculi* and other flowers, with a luxuriant growth of some *Hypnum*, it formed a striking feature in the flora of a "Nunatak," or snowless peak, arising out of the Verhoeff glacier.

***Draba rupestris* R. Br.**

Dr. Burk.

***Cochlearia officinalis* L.**

At Disco usually but about 3 inches high, but at Atanekerdruk, in Waigat Strait, opposite Disco, double the size. A favorite food of the Eskimos both North and South.

***Braya glabella* Richards.**

McCormick Bay and Inglefield Gulf.

***Lychnis apetala* L.**

Remarkably variable. Sometimes with quite showy petals. Flowers often singly on scapes, at others in 5-6 flowered capitate heads, and again with flowers scattered along the stems. One specimen at Inglefield Gulf close to the front edge of a receding glacier, which spot had been covered by solid ice within a year or two.

***Silene acaulis* L.**

Everywhere in very wet or very dry places indiscriminately.

***Cerastium alpinum* L.**

At Disco spreading. At Upernavik sub-erect. Above Melville Bay, at Wostenholm, and northwardly in small compact erect masses.

***Stellaria longipes* Goldie, var. *Edwardsii* R. Br.**

On the Verhoeff Nunatak the plants were but two inches high. Much larger elsewhere in Greenland.

***Stellaria humifusa* Rottbl.**

Seems scarce, only one small specimen from Disco.

***Arenaria Grœnlandica* Spreng.**

McCormick Bay.

***Arenaria peploides* L.**

Disco. July 14th. One flower with a remarkably large colored calyx; the sepals being three quarters of an inch long. The cause of this abnormal growth not determined.

Potentilla emarginata Pursh.

Wostenholm Island, Upernavik, and on the Nunatak in the Verhoeff glacier.

Potentilla nivea L.

Dr. Burk.

Potentilla pulchella R. Br.

Disco.

Potentilla maculata Pourr.

Disco, not in Dr. Burk's collection.

Potentilla tridentata Ait.

Godthaab, and as far North as Disco.

Dryas octopetala L.

Next to *Papaver* perhaps the commonest flower of Greenland. Sometimes in clumps of a foot across, with sometimes a hundred flowers open at once. Also on the Verhoeff Nunatak.

Alochemilla vulgaris L.

Varying in size. At Disco preferring wet places.

Saxifraga cæspitosa L.

Saxifraga cernua L.

Disco. On the Verhoeff Nunatak.

Saxifraga flagellaris Willd.

McCormick Bay. Appears to be rare. I only found a few plants here, and only one specimen was seen by Dr. Burk, and that in the same locality.

Saxifraga oppositifolia Willd.

Growing in great masses, and giving great beauty to the rocks about the "Redcliff House," Lieutenant Peary's winter quarters.

Saxifraga nivalis L.

Disco.

Saxifraga rivularis L.

Above Meville Bay, not half the size of those at Disco.

Saxifraga tricuspidata Retz.

Common everywhere. On the Verhoeff Nunatak.

Saxifraga azoides L.

Wostenholm Island and McCormick Bay, not in Dr. Burk's collection.

Saxifraga stellaris L.

Not in Dr. Burk's collection, but not rare at Disco. Much larger than specimens from Point Barrow, on the Northwest Pacific coast.

Sedum Rhodiola D. C.

Rocks at Godthaab.

Cornus canadensis L.

Godthaab specimen not collected though observed by me.

Epilobium angustifolium L.

Not collected by Dr. Burk.

Epilobium latifolium L.

Found on cliffs close up to the ice cap.

Erigeron alpinus L.

Found only by Dr. Burk.

Erigeron compositus Pursh.

Inglefield Gulf. It is interesting to note that while the plants of Greenland vary much according to location, these are exactly like Rocky Mountain specimens, and specimens of Nuttall from Walla Walla on the Columbia River.

Matricaria inodora L.

This indomitable traveler has gained a foot-hold in Disco. Soil was brought from Denmark for the Inspector's garden, and the seed probably came in that way.

Antennaria alpina Gærtn.

Varying in no degree from those in American alpine heights.

Artemisia borealis Pall.

Disco. Not in the collection of Dr. Burk.

Arnica alpina Olin.

In great abundance on the Verhoeff Nunatak.

Taraxacum officinale Web.

The *tividum* form common at Disco.

Campanula uniflora L.

Disco.

Campanula rotundifolia L.

Disco. Nearly always with a single large flower on the scape.

Vaccinium uliginosum L.

Some of the plants have the leaves colored with rose. These are always sterile; only the fully green-leaved plants produce berries. These are gathered and prepared for food by the Esquimos. To us the berries seemed tasteless.

Rhododendron Lapponicum Wahl.

Collected by Dr. Burk. I did not meet with it in flower, but a specimen was among some given me by the Inspector at Disco.

Bryanthus taxifolius Gr.**Cassiope hypnoides** Don.

Almost everywhere where the ground was dry.

Cassiope tetragona Don.

Only in dry places. Emitting a delightful odor, like that of a Lily of the Valley; overhanging rocks in long spreading masses; collected and preserved for fuel by the North and South Greenland Esquimos.

Ledum palustre L.

"Labrador tea" and used as tea by the South Greenland Esquimos.

Pyrola rotundifolia var. **pumila** L.**Diapensia Lapponica** L.

Disco.

Armeria vulgaris L.

Disco.

Mertensia maritima Don.

Sea Beach at Disco.

Veronica alpina L.

Disco.

Bartsia alpina L.

Disco.

Pedicularis capitata Adams.

Disco.

Pedicularis flammea L.

Disco. Found only by myself.

Pedicularis hirsuta L.

McCormick Bay. Variable. Now growing to a foot high and branching, and now but an inch or two high, with a simple stem.

Pedicularis Lapponica L.

Disco.

Pedicularis versicolor Wahl.

Disco. Dr. Burk.

Polygonum viviparum L.

Sometimes with leaves in dense tufts with leafy flower stems. When not viviparous the plant is dwarf and the flowers bright rosy-red. In the inconspicuous state the scapes are tall and usually leafless.

Oxyria digyna Willd.

Widely distributed throughout Greenland.

Betula nana L.

Common in company with the arctic willow at Disco and southwardly, growing about six inches high, and forming tufts of several feet radius. It is found from Cape Farewell to Duck Islands, the south border of Melville Bay. This is probably its limit. I found it no further north. Saved for fuel by the South Greenland Eskimos.

Salix arctica R. B.

Average height 6 inches but spreading often to 6 feet in the circumference of its branches. But its short stem grows quite thick. At Disco, I saw one with the short trunk as thick as one's wrist, hanging from a crevice in a rock. Grows at all altitudes from the Beach line close to the ice cap. In Inglefield Gulf found large old plants up to within 20 feet of a receding glacier, and on a spot which had certainly been covered by ice less than two years before. There were no lateral or medial moraines to bring the plants, and all the facts on the spot led to the conclusion that the willows had been buried when the glacier flowed over the spot and had been dormant until the ice receded. Professor Heilprin coincided with me in this conclusion. Catkins used by Eskimos for tinder.

Salix herbacea L.

Disco and Upernavik.

Abies obovata Loud.

In sheltered fiords near Godthaab and southwardly. Only seen and not collected by me or Dr. Burk. In some situations growing from four to eight feet high.

Empetrum nigrum L.

The Eskimos are very fond of the fruit. Women and children go out to gather it, as they would blackberries or strawberries with us. I was told that at Disco and Godthaab the natives make preserves of it. It is kept for fuel.

Tofieldia palustris Hudson.

Disco.

Luzula arcuata Mey.

Luzula spadicea D. C.

Disco. Not in Dr. Burk's collection.

Eriophorum polystachyon L. var. *latifolium*.

Called by the natives Ewicksua—"Rabbits-foot grass." Used by the Eskimos as punk or tinder. It is first ignited by a spark, and then blown into a flame on dry moss. It grows in vast quantities in low wet places. From Melville Bay south it reaches a foot high, —but only about six inches above that point.

Scirpus cæspitosus L.

Dr. Burk.

Carex vulgaris Fr. var. *hyperborea*.

Carex atrata Boott.

Not in Dr. Burk's collection. Specimens in the Herbarium of the Academy collected in latitude 81°, 82° by Dr. Emil Bessels of the ill-fated Polaris expedition are barely 2 inches high. These from McCormick Bay are about one foot.

Kobesia scirpina Willd.

Dry places, McCormick Bay. Plants remarkably stout and stocky, but culms scarcely reaching three inches high.

Hierochloë alpina R. & S.

McCormick Bay. Making a close herbage nearly one foot high.

Alopecurus alpinus L.

This seems to be the prevailing grass around Eskimo settlements. It grows in such wild luxuriance, with herbage a foot in height, and of such a vivid green that it can be seen for two or three miles from the shore. Some of my specimens were 18 inches in length. At Godthaab hay is made from it.

Poa alpina L.

Near Disco it grows from 18 inches to 2 feet high, but the leaves are comparatively short.

Poa arctica R. Br.

Poa nemoralis L.

Upervik.

Poa pratensis L.

Not in Dr. Burk's collection. Abundant in McCormick Bay. At Disco it makes culms 18 inches to 2 feet.

Trisetum sesquiflorum Trin.

Collected only by myself. McCormick Bay.

Glyceria fluitans.

Only by Dr. Burk.

Festuca ovina L. var. *brevifolia*.

Festuca ovina var. *vivipara*.

At Godthaab, but growing only about six inches high.

Arctagrostis latifolia Griesb.

Elymus mollis Trin.

Disco. Not in Dr. Burk's collection. At Atanekerdlut, reaching three or four feet high along the Sea Beach.

Equisetum arvense Lin.

Equisetum variegatum.

Dr. Burk.

Woodsia ilvensis Br.

Disco. In crevices of rocks.

Cystopteris fragilis Bernh.

Disco. About 12 inch fronds, in crevices of rocks. Not in Dr. Burk's collection.

Nephrodium spinulosum Mul.

Crevices of Rocks at Godthaab. Among the few things cultivated by the Danes at Godthaab. Not in Dr. Burk's collection.

Lycopodium annotinum L.

Disco, reaching close to the edge of the ice cap.

Lycopodium Selago.

Disco, reaching about two inches high.

LICHENS.

The collection has been kindly determined by Dr. John M. Eckfeldt. Those marked * were also collected in the first expedition by Dr. Burk. † Collected only by Dr. Burk.

The profusion of Lichens strikes the visitor to Greenland at once on reaching its shores. Many species seem to have preferences for peculiar situations, and give the rocks when at some distance the appearance of being variously colored.

**Cetraria nivalis* (L.) Ach.

†*Cetraria Islandica*.

Cetraria cucullata (Bill.) Ach.

**Alectoria ochroleuca* Nyl.
var. *rigida* Fr.

Theloschistes lychnus Nyl.

Parmelia saxatilis (L.) Fr.

McCormick Bay.

Parmelia conspersa (L.) Wallr.

McCormick Bay.

Parmelia lanata (L.) Wallr.

McCormick Bay.

Parmelia incana (Pers.) Fr.

McCormick Bay.

Physcia pulverulenta Schreb.

McCormick Bay.

Umbilicaria proboscidea (L.) Stin.

McCormick Bay.

Umbilicaria rugifera Nyl.

McCormick Bay.

**Umbilicaria hyperborea* Hoff.

McCormick Bay.

Umbilicaria anthracoria Wulf.

McCormick Bay.

Nephroma aretica (L.) Fr.

McCormick Bay.

†*Peltigera canina* (L.) Hoffm.

†*Peltigera aphthosa* L.

Solomia saccata (L.) Ach.

Solomia crocea (L.) Ach.

†*Pannaria hypnorum* (Hoff.) Kolb.

Collema melænum Ach.

McCormick Bay.

Placodium vitellinum Ehrh.

McCormick Bay.

Placodium elegans Link.

McCormick Bay.

Lecanora lentigera (Webb.) Ach.

McCormick Bay.

Lecanora ventosa (L.) Ach.

Rinodina sophodes (Ach.) Nyl.

Pertusaria coriacea (Th.) Fr.

†*Pertusaria paradoxa* Lindb.

Gyalecta peziza Mont.

†*Stereocaulon alpinum* Lam.

Cladonia pyxidata (L.) Fr.

Cladonia gracilis (L.) Nyl.

var. *elongata*, forma *macroceris* Tuck.

Cladonia deformis (L.) Hoff.

Lecidia platycarpa Ach.

McCormick Bay.

Buellia geographica (L.) Tuck.

McCormick Bay.

Sphærophorus globiferus (L.) D. C.

McCormick Bay.

Coniocybe furfuracea L.

Verrucaria pygmæa Koelt.

Parasitic on *Cladonia gracilis*.

Thamnolia vermicularis (Sw.) Ach.

MOSESSES.

Collected at McCormick and Robertson's Bay.

Andræa Blythii Schimp.
Aulacomnion palustre L.
Aulacomnion turgidum Wahl.
Bryum argenteum L.
Bryum inclinatum.
Bryum nitidulum Lindb.
Bryum pendulum.
Bryum pyriforme L.
Dieranoweisia crispula Lindb.
Grimmia apocarpa Hedw.
Hypnum nitens Schrd.
Hypnum Richardsoni Mitt.
Hypnum splendens Hedw.
Hypnum uncinatum Hedw.

Onchophorus polycarpus Brid.
Onchophorus Wahlenbergii var.
Orthothecium chryseum Brid. & Sch.
Orthotrichum arcticum Schimp.
Philonotis fontana Brid.
Pottia Heynei var.
Pogonatum alpinum and var. Roth.
Pohlia cucullata.
Pohlia nutans.
Racomitrium lanuginosum Brid.
Sphagnum fimbriatum var. Wils.
Swartzia montana var. Lam.
Tetraplodon bryoides Lindb.
Funaria hygrometrica var. Sib.